

DELINEATING PROTECTION ZONES FOR HORIZONTAL WELLS

Suggested Approach

A horizontal well is any well that is drilled at an angle above the horizontal plane (i.e., water can flow by gravity). The best way to determine the protection zones for a horizontal well is to do detailed hydrogeologic analysis. However, if this is not feasible, the California Department of Health Services (DHS) suggests the following method.

Step 1: Determine if the horizontal well is under the influence of surface water (either direct or indirect). (If this determination has been formalized with DHS, make sure to state this in the assessment summary). If the horizontal well is under the direct influence of surface water, define watershed boundaries as the outer/overall protection area. To define zones within the protection area, or to define zones for ground water horizontal wells, proceed with the following steps.

Step 2: Determine the maximum discharge rate in gallons per minute (gpm). If the discharge rate is not known, and can be assumed to be less than 20 gpm, proceed to the next step. Otherwise, estimate the discharge rate using previously released guidance.

Step 3: Determine, if possible, the approximate thickness of the aquifer from which the horizontal well receives water. If this information isn't available, move on to the next step.

Step 4: Determine an approximate 'length of screened interval' for the source. Use 10% of the thickness of the aquifer OR 10% of the discharge rate in gpm OR the length of perforated piped in the horizontal well, whichever is less. Regardless, do not use less than 10 feet.

Step 5: Assume an effective porosity of 0.20 (20%)

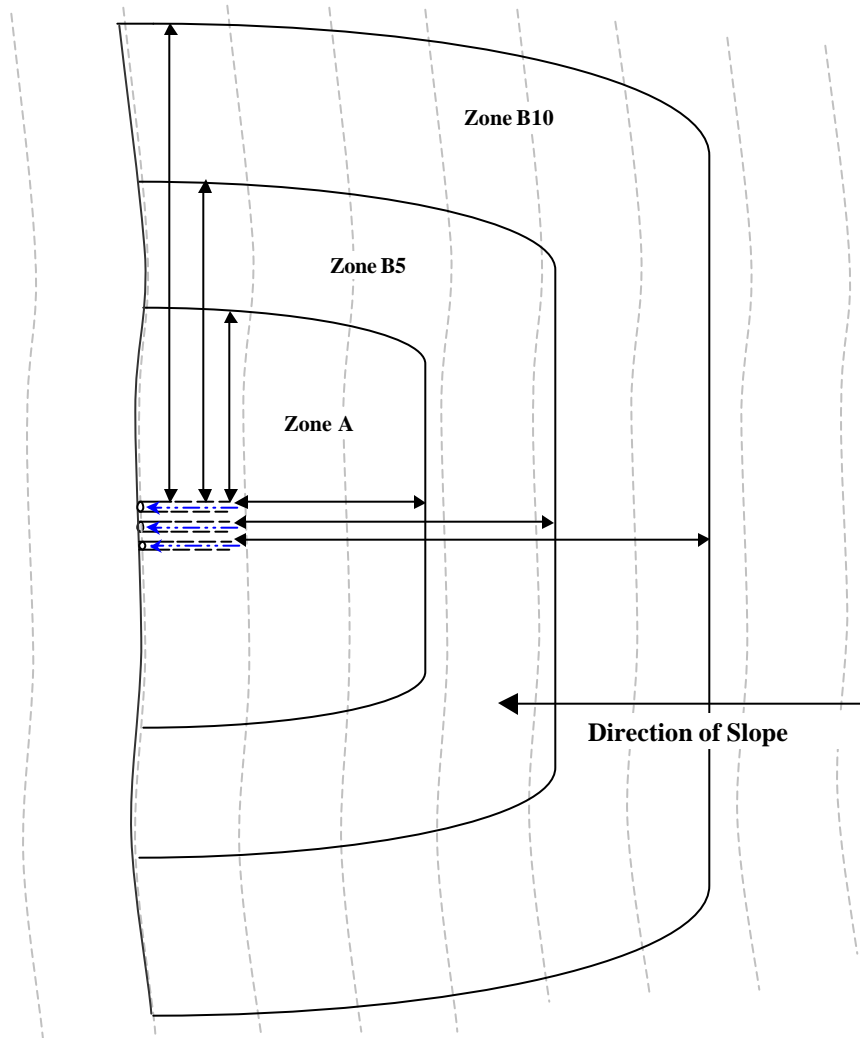
Step 6: Calculate the size of the protection zones for the 2, 5 and 10-year travel times (Zones A, B5, and B10), using the Calculated Fixed Radius method. Use the discharge rate, 'length of screened interval' and effective porosity as described above. If this is a transient system, define only the 2 year time of travel. If the discharge rate is less than 20 gpm, use the minimum distances in the DWSAP program.

Step 7: If the horizontal well is located in fractured rock increase the size of the zones by 50%

Step 8: Locate the zones on a USGS quad map. The shape of the zones will be different than for vertical wells. Locate the elevation of the pipe outlet and draw a topographic contour line at the same elevation. Draw three zones (one for transient system sources) around the pipe outlet. Place the center of the zones at the outlet. The zones should extend up gradient the length of the collection piping plus the zone distance. The zones should extend to each side of the collection piping the zone distance (see illustration). The down gradient limit of the zones is the topographic contour line at the well outlet.

Step 9: Review the delineation and see if it makes sense. Do the protection zones overlap a significant water body? If the water body is up gradient, the horizontal well may be under the influence of surface water.

(See illustration next page)



Delineation of Protection Zones for Horizontal Wells